CLAIMS

I claim:

1. Amperometric sensing apparatus for detecting an analyte in a gaseous medium, which comprises:

a working electrode at which said analyte is caused to participate in an analyte half-cell reaction:

a reference electrode for controlling the electrochemical potential of said working electrode;

a counter electrode at which a complementary half-cell reaction is caused to occur;

wherein all three electrodes are electrochemically connected through an electrolyte; and

means for preventing or minimizing the occurrence of said analyte reaction or reaction of any interfering gas at said counter electrode and/or reference electrode.

2. The apparatus of claim 1, wherein said counter and/or reference electrode comprises a material selected to minimize said analyte reaction.

3. The apparatus of claim 2, wherein said material is a catalyst which is poisoned towards the analyte reaction.

4. The apparatus of claim 2, wherein the potential of the counter electrode is maintained at a value which renders it inactive to the analyte reaction.

5. The apparatus of claim 1, wherein said means comprises a barrier which prevents or minimizes access of said analyte to said counter and/or reference electrode.

6. The apparatus of claim 5, wherein said barrier comprises a scavenger material or electrode at which the analyte reacts before it can reach the counter and/or reference electrode.

7. The apparatus of claim 5, wherein said barrier comprises a lengthy path through the electrolyte between the working and counter and/or reference electrodes.

8. The apparatus of claim 2, wherein said material comprises a gaseous or liquid reagent which results in the predominance of a complementary reaction at the counter electrode to the exclusion of the analyte reaction.

9. The apparatus of claim 2, wherein said analyte is CO or H_2 and said material comprises Ir or oxides of Ir, Au, Pb/PbO_2, Ag/AgCl, Ru, Pd, low-surface-area Pt or any other substance at which electro-oxidation of CO and/or H2 or other interfering gas is hindered.

10. The apparatus of claim 9, wherein said analyte is H_2 and wherein the means for preventing the occurrence of interfering gas such as CO at the counter and/or reference electrode is a barrier over the entrance to the gas sensor comprising a thin film of material that is highly permeable to H_2 but impermeable to CO and other interferences.

11. The apparatus of claim 10, wherein said material is FEP Teflon about 0.002" thick.

12. The apparatus of claim 5, wherein said barrier comprises a coating of Nafion or other material over the counter electrode.

14. The apparatus of claim 8, wherein said analyte is oxidizable and said material comprises oxygen that is fed to the counter electrode through a separate hole.

15. The apparatus of claim 8, wherein the counter and/or reference electrode is isolated from any sampled gaseous medium.

16. The apparatus of claim 1, wherein said counter and reference electrodes are combined into a single electrode.

17. The apparatus of claim 1 comprising means of enhancing the reactivity of the counter electrode to the product of the analyte reaction.

18. The apparatus of claim 17 comprising means for reconverting the product of the analyte reaction back to the analyte and then reacting it again at the working electrode, with such back-and-forth reactions repeating many times, so as to yield an amplification of the analyte signal.

19. The apparatus of claim 18, wherein said reconversions are caused to occur at the counter electrode.

20. The apparatus of claim 19, wherein said analyte and reconverted product comprise the NO-NO_2 or Cl^--Cl_2 redox couple.

21. The apparatus of claim 19, wherein said working and counter electrodes are interdigitated or comprise an array of electrodes which are addressable in subsets.

22. Amperometric sensing apparatus for detecting an analyte in a gaseous medium, which comprises:

a first working electrode at which said analyte is caused to participate in an analyte half-cell reaction; and

a second working electrode for reconverting the product of the analyte reaction back to the analyte and then reacting it again at the first working electrode, with such back-and-forth reactions repeating many times, so as to yield an amplification of the analyte signal.

23. The apparatus of claim 22, wherein said analyte and reconverted product comprise the NO-NO_2 or Cl^--Cl_2 redox couple.

24. The apparatus of claim 22, wherein said working electrodes are interdigitated.

25. A method of detecting the presence of an analyte or trace thereof in a gaseous medium comprising the steps of:

passing a sample of said gaseous medium over a pair of interdigitated electrodes forming part of an amperometric gas sensor system, while applying an oxidizing potential to one electrode of said pair and a reducing potential to the other electrode of said pair, so as to cause repeated oxidations and reductions of said analyte and/or of its redox product and thereby product amplified current signals due to said analyte and product;

measuring said amplified current signals; and

deducing the presence and/or concentration of said analyte in said gaseous medium from said measured current signals.

26. The method of claim 25, wherein said analyte and product comprise the NO-NO_2 or Cl^--Cl_2 redox couple.